Docket No.: MSFT-2955/307064.01 App. No.: Not Yet Assigned Title: SYSTEMS AND METHODS FOR FRAGMENT-BASED SERIALIZATION Filed: Herewith Inventors: F. Soner Terek, Ajay Kalhan, Nagavamsi Ponnekanti, Srikumar Rangarajan, and Michael J. Zwilling Attorney: Nathaniel Ari Long Phone: (215) 568-3100 Sheet 1 of 8 Record Format Payload HEADER **PAYLOAD** Height Weight Name Soc. Sec. Fragment 1 (Primitive (Binary Fragment) Members) Non-Record Format Payload HEADER Fragment 2 **PAYLOAD** (No Payload) HEADER Fragment 3 FIG. 1

Type (1byte) Value Type (2 or 8 bytes) Bit field (4bytes) Payload

FIG. 2

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```
class tPerson
   m_name
                  string;
                  int;
   m age
                 tSetOfAddresses;
                                       // This is a collection or multiset.
   m_locations
};
class tAddress
   m_street
                  string;
   m_city
                  string;
                  string;
   m_zip
};
class tEmployee: tPerson
{
   m_empNo
                  string;
   m_dept
                  string;
   m_photo
                  image;
};
Class tPartTimeEmployee: tEmployee
{
   m_hoursPerWeek
                         int;
};
```

FIG. 3

Docket No.: MSFT-2955/307064.01 App. No.: Not Yet Assigned Filed: Herewith Title: SYSTEMS AND METHODS FOR FRAGMENT-BASED SERIALIZATION Inventors: F. Soner Terek, Ajay Kalhan, Nagavamsi Ponnekanti, Srikumar Rangarajan, and Michael J. Zwilling Attorney: Nathaniel Ari Long Phone: (215) 568-3100 Sheet 3 of 8 Generating a Fragment Generating a Fragment for Primitive Members: for Primitive Members: **Object With No Nested Members Object With Nested Members** Generate Binary Fragment **Generate Binary Fragment** Place Primitives in Fragment, Place Primitives in Fragment, in Record Format in Record Format Set a Bit in the Type Field to Set a Bit in the Type Field to Indicate a Binary Fragment Indicate a Binary Fragment Set a Bit in the Type Field to Set Length Field to Indicate Indicate a Self-Terminating Length of the Payload Fragment (e.g. By Placing "OR" Operator in the Self-Terminator Bit) **Emit the Fragment** Set Length Field to Indicate Length of the Payload Process Nested Members. Placing Them in New Fragment(s) Emit the Fragment Emit New Fragment(s) FIG. 4 Generate Terminator

.....

Emit Terminator Fragment

FIG. 5

Fragment to Mark the End of Nested Members

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Generating Fragments for Collection Members

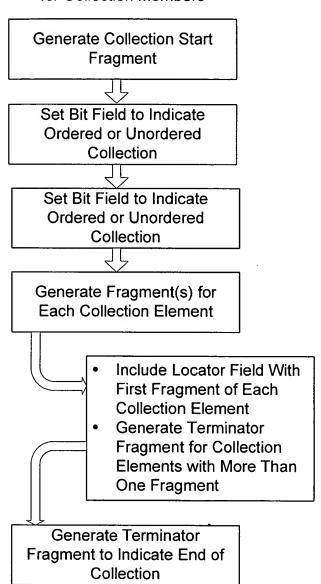


FIG. 6

Generating Fragments for LOB and FS Members

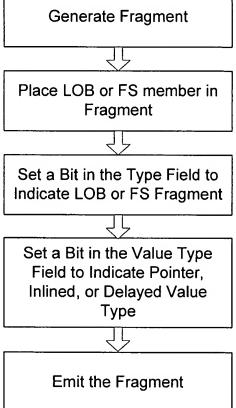


FIG. 7

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Serializing an Entire Object

Place All Primitive Members, Except LOBs, in a Binary Fragment (see Fig. 4 and Fig. 5)

Set Type Field of Binary Fragment to Indicate an Object Type

Place Any LOB or FS Member in a LOB or FS Fragment (see Fig. 7)

Place Any Collection Members in Collection Fragment(s) (see Fig. 6)

If More Than One Fragment was Generated, Generate Terminator Fragment to Mark the End of the Serialization

FIG. 8

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Single Column of a Database

| Objects | Data | Data |
|---------|------|------|
| | | |
| | | |
| | | |
| | | |

FIG. 9

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Metadata for Person Objects

| Name | Phone # | Address | SS# | Weight |
|-----------------|----------|---------------------------|-------------|--------|
| Person Object R | ecords | | · | |
| Henry | 547-5268 | 2 N. 53rd St. | 383-99-9876 | 2301bs |
| Margaret | 549-9254 | 4 N. 67 th St. | 398-74-4565 | 160lbs |

(Prior Art)

FIG. 10

| 11(A) | ad – SE Record \backsim FIG. 1 | | Length (2bytes) | Type (1byte) |
|-------|--|--------------------------|------------------------|--------------|
| | Payload – LOB, Pointer, or Cell Reference | Length (2 or 8 bytes) | Value Type (1 byte) | Type (1byte) |
| 11(B) | ŶFIG. | | | |
| | Payload – FS, Pointer, or Cell Reference | Length (2 or 8 bytes) | Value Type (1 byte) | Type (1byte) |
| 11(C) | ीFIG. | | | |
| , | (D) | IG. 11 | ↓ F | Type (1byte) |
| | G. 11(E) | ← FI(| Bit field (2bytes) | Type (1byte) |
| | Payload – Collection Element | Locator (4bytes) | Length (2bytes) | Type (1byte) |
| | | | | |

← FIG. 11(H) Locator Type (1byte) (4bytes)

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Binary Fragment for tPerson

Binary Fragment for tEmployee

Binary Fragment for tPartTimeEmployee

Terminator for tPerson

FIG. 12